Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052
Telephone: (425) 883 0777
Fax: (425) 882 5498

TECHNICAL MEMORANDUM

TO:	Will Ernst, Mike Gleason (Boeing)	**DATE:**	November 7, 2005
FR:	Ted Norton (Golder)	**OUR REF:**	013-1646.002.400
RE:	Boeing Plant 2, Wastewater Containment Structure Area Pre- and Post-Excavation Sampling Results		

Boeing is constructing a Wastewater Containment Structure in the parking area on the south side of Building 2-122 at Plant 2 (Figure 1). This memorandum presents the results of pre- and post construction soil sampling conducted within and proximal to the excavation areas.

Boeing has removed asphalt and excavated soil to accommodate foundation construction and installation of the Wastewater Containment Structure. Figure 1 shows the footprint of the Wastewater Containment Structure and sample locations. None of the excavations associated with the WCS are adjacent to, downgradient, or within the extent of any identified RCRA units at Plant 2.

This memorandum presents analytical results for soil samples collected subsequent to cutting asphalt and exposing soil in the construction location and during excavation. Sampling was conducted to monitor health and safety and to characterize soil for disposal. Soil samples were collected prior to excavation activities at six locations using a hand auger. One soil sample was collected during excavation to determine if polychlorinated biphenyls (PCBs) remained at depth proximal to sample location (PL2C-WCS-03-0038) following excavation of the utility trench to the north of the WCS. As the excavations did not extend down to the water table, groundwater samples were not collected. Soil samples were collected as outlined in the August 3, 2005 Technical Memorandum and in general accordance with the Plant 2 *Compendium of Sampling and Analysis Plans and Quality Assurance Project Plans for Boeing Plant 2 Seattle* (Golder, 2004). No samples were collected within the boundaries of a RCRA unit.

Soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), PCBs and metals. Table 1 presents results for those constituents of concern (COCs) detected above reporting levels for each of the soil samples. Constituent concentrations exceeding the 1999 Plant 2 PMCLs (Weston, 1999) are shaded.

Aside from SVOCs and PCBs, arsenic and mercury were the only COCs detected above PMCLs. At location PL2C-WCS-01, arsenic was detected above the PMCL (7.3 mg/kg) in samples collected 2.5 feet below ground surface (bgs) and 4.8 feet bgs (11 mg/kg and 8 mg/kg, respectively). At location PL2C-WCS-02, arsenic (10 mg/kg) and mercury (0.08 mg/kg) were detected above PMCLs (7.3 mg/kg and 0.07 mg/kg, respectively) in a sample collected from 3.8 ft bgs, and arsenic (10 mg/kg) in a sample collected at 6.6 ft bgs. At location PL2C-WCS-03, arsenic (11 mg/kg) was detected above its PMCL at a depth of 3.6 ft bgs. Arsenic was detected above the PMCL in the sample at location PL2C-WCS-04 collected at 3.6 ft bgs, and in samples collected from location PL2C-WCS-04a at depths of 5.8 ft bgs and 7.6 feet bgs (7 mg/kg, 8 mg/kg, and 15 mg/kg, respectively). Mercury was detected at PL2C-WCS-04a (0.15 mg/kg) above its PMCL (0.07 mg/kg) at the depth of 5.8 ft bgs. At

location PL2C-WCS-05, arsenic (9 mg/kg) was detected above its PMCL at a depth of 3.8 ft bgs. None of the COCs was detected above 3 times its respective PMCL.

Among SVOCs, benzo(a)anthracene (13 µg/kg), benzo(a)pyrene (17 µg/kg), benzo(b)fluoranthene (17 µg/kg), benzo(k)fluoranthene (13 µg/kg), and chrysene (32 µg/kg) were detected above their respective PMCLs (each 2.9 µg/kg) in the sample collected 2.5 ft bgs at location PL2C-WCS-01; chrysene (12 µg/kg) was also detected in the sample collected 4.8 ft bgs at this same location. Benzo(a)pyrene (7.1 µg/kg), benzo(b)fluoranthene (7.1 µg/kg), benzo(k)fluoranthene (7.1 µg/kg), and chrysene (9.0 µg/kg) were detected above their respective PMCLs in the sample collected 3.8 ft bgs at location PL2C-WCS-05.

PCB analysis revealed total aroclors exceeding PMCLs (33 µg/kg) in three samples: PL2C-WCS-01 at 2.5 ft bgs (35 µg/kg), PL2C-WCS-02 at 3.8 ft bgs (179 µg/kg), and PL2C-WCS-03 at 3.6 ft bgs (101 µg/kg).

Subsequent to sampling, soils were removed in the process of excavating the Wastewater Containment Structure and associated utility trench in the vicinity of samples PL2C-WCS-01, PL2C-WCS-03, and PL2C-WCS-04. In the WCS excavation, PCB-impacted soil was excavated to an approximate depth of 3 to 3.5 ft bgs vicinity of PL2C-WCS-01. Soil was excavated in the general vicinity of PL2C-WCS-04 to a depth of 4.5 to 5 ft bgs, and further excavated in the immediate sample location to a depth of 6 feet bgs in order to remove mercury-impacted soil. In the utility trench, PCB-impacted soil was excavated to a depth of 5.5 ft bgs. In all cases, excavation exceeded the depth of samples with COC results exceeding their respective PMCLs.

Excavated soils from the WCS and utility trench were stockpiled and segregated with concrete blocks and plastic sheeting in a discrete stockpile (Stockpile B) on the Building 2-65 slab. Mercury-impacted soil excavated from the immediate location of PL2C-WCS-04 was placed in a discrete roll-off container. Stockpiled soils will be evaluated by Boeing and will be disposed of or reused at their discretion.

References

Roy F. Weston, Inc. *Technical Memorandum Appropriateness Evaluation Corrective Measures Study Boeing Plant 2,* March 1999.

Golder Associates Inc. *Compendium of Sampling and Analysis Plans and Quality Assurance Project Plans for Boeing Plant 2 Seattle/Tukwila, Washington.* August 2004.

Golder Associates Inc. Technical Memorandum: *Boeing Plant 2, 2-124 Area Excavations Evaluation.* August 3, 2005.

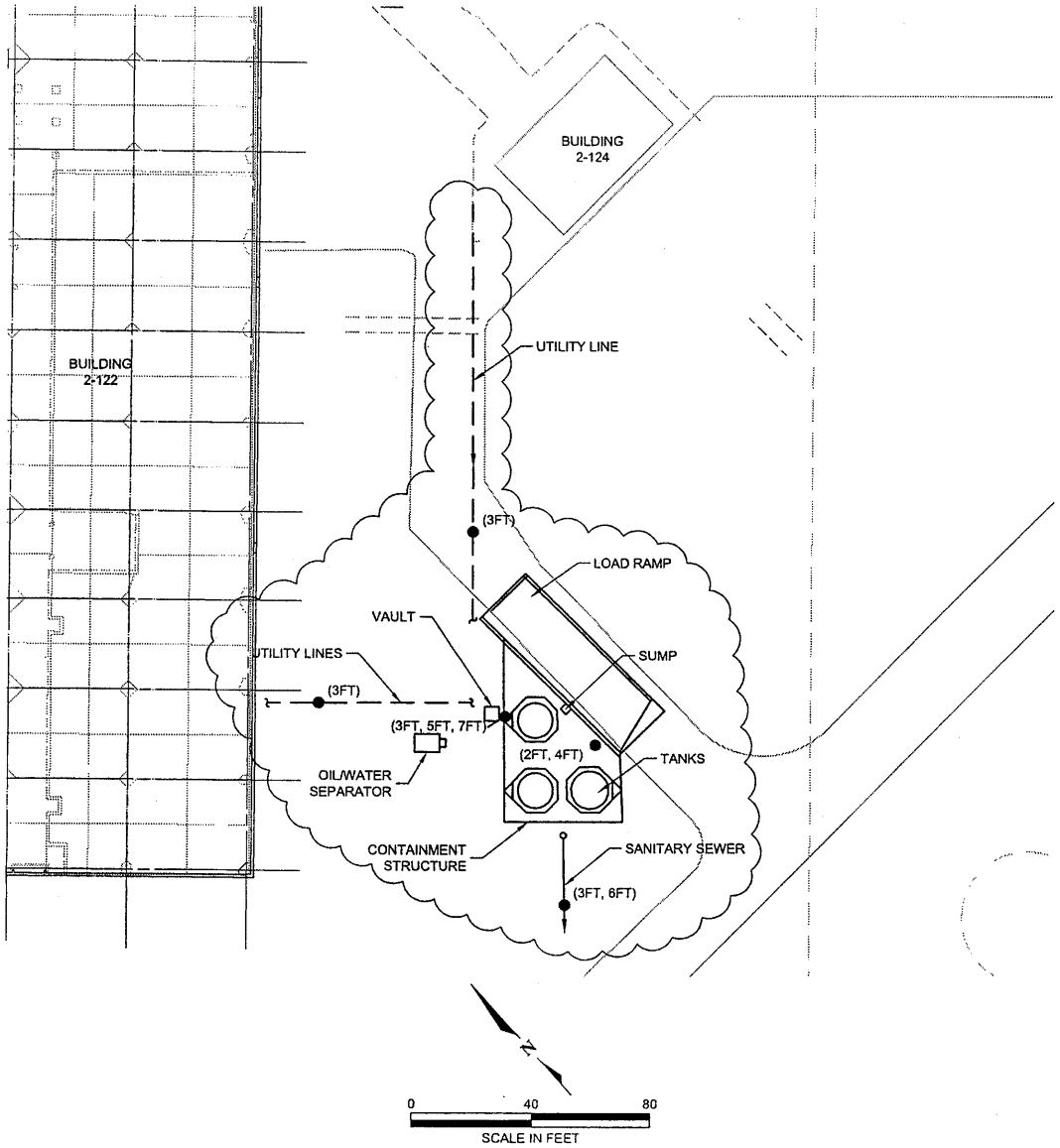
cc: K. Angelos (Golder)

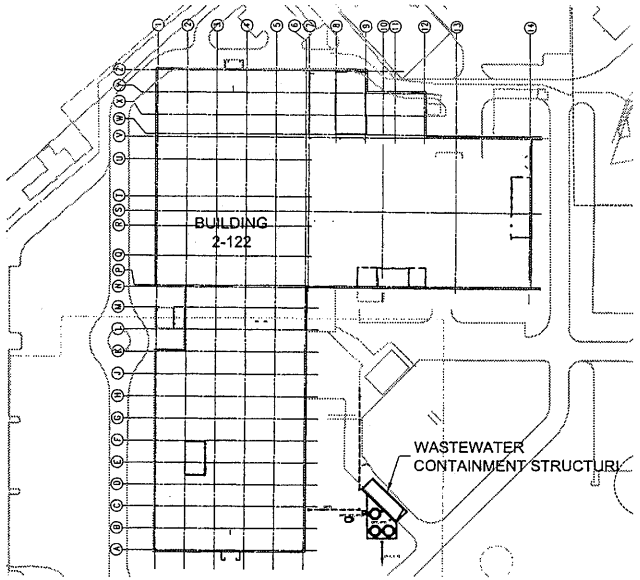
Attachments: Table 1
Figure 1

Wastewater Containment Structure
Construction Sampling
September 2005

Parameter	PMCL	2004 Soil Screening Level	Sample Location: Sample Date: Depth (ft): Sample ID:	PL2C-WCS-04a 9/30/2005 5.8 PL2C-WCS-04a-0058	PL2C-WCS-04a 9/30/2005 7.6 PL2C-WCS-04a-0076	(Reanalysis) PL2C-WCS-04a 9/30/2005 7.6 PL2C-WCS-04a-0076	PL2C-WCS-05 9/30/2005 3.8 PL2C-WCS-05-0038
VOCs (µg/kg)							
2-Butanone	-	-		6.3 U	23	20	5.7 U
Acetone	255,285,800	-		6.3 U	92	110	5.7 U
Methylene Chloride	96,000	828		2.5 U	9.0	4.0	2.3 U
SVOCs (µg/kg)							
Benzo(a)anthracene	2.9	41.9		6.4 U	6.5 U		6.4 U
Benzo(a)pyrene	2.9	113		6.4 U	6.5 U		7.1
Benzo(b)fluoranthene	2.9	144		6.4 U	6.5 U		7.1
Benzo(k)fluoranthene	2.9	144		6.4 U	6.5 U		7.1
Chrysene	2.9	46.6		6.4 U	6.5 U		9.0
Fluoranthene	9,000	44,000		6.4 U	6.5 U		9.7
Phenanthrene	-	-		6.4 U	6.5 U		6.4 U
Pyrene	30,000	1,750,000		6.4 U	6.5 U		10
Metals (mg/kg)							
Aluminum	32,581	-		10,000	20,100		10,800
Arsenic	7.3	5		8	15		9
Barium	-	93,300		29.6	63.4		36.2
Beryllium	0.6	222		0.2	0.4		0.2
Chromium	1,000	-		11.9	21.2		17.3
Cobalt	-	-		6.6	10.1		5.9
Copper	36.4	1.38		12.8	31.2		17.3
Iron	-	-		11,500	19,600		13,700
Lead	400	1,000		2 U	5		4
Magnesium	-	-		2,240	4,610		2,660
Manganese	1,146	130		139	179		129
Mercury	0.07	0.05		0.15	0.06 U		0.06 U
Molybdenum	-	-		0.6 U	0.7 U		0.5 U
Nickel	38.2	10.7		9	17		11
Thallium	8.9	0.669		0.1 U	0.1		0.2
Vanadium	13,000	56,100		40.6	64.5		49.4
Zinc	107	101		26.4	42.5		30.9
Petroleum Hydrocarbons (mg/kg)							
TPH - Diesel Range	200	2,000		50 U	50 U		50 U
TPH - Motor Oil Range	200	2,000		100 U	100 U		100 U
PCBs (µg/kg)							
Total Arochlors	33	33		33 U	33 U		33 U

Notes:
- = PMCL or Screening Level not available.
Shading indicates detected concentration exceeds PMCL.





LOCATION MAP
NOT TO SCALE

LEGEND
(3FT) (DEPTH FT bgs)
SOIL SAMPLING LOCATION
AREA INCLUSIVE OF EXCAVATIONS

FIGURE **1**

WASTEWATER CONTAINMENT STRUCTURE AREA PLANNING MAP
SAMPLE LOCATIONS
BOEING/PLANT 2 CMS/WA

013164002400F05.dwg | Layout: Layout3 | Modified: 09/19/2005, 09:40 | Plotted: 09/19/2005, 10:31

Golder Associates